General Specifications

Item	Specification
Cooling System Capacity	
System capacity L (qts)	3.75 (4.0)
Coolant Type	
Motorcraft Premium Engine Coolant VC-4-A (CXC-10 in Canada, VC-5 in Oregon) [a]	ESE-M97B44-A
Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) [a] [b]	WSS-M97B51-A1
Other Chemicals	
Premium Cooling System Flush VC-1	ESR-M14P7-A
Premium Long Life Grease XG-1-C	ESA-M1C75-B
Cooling System Stop Leak Pellets VC-6	ESE-M99B37-5 except as noted in ES-F65E-19A511-AA
Cooling System Pressure Test Specifications	
System (radiator) kPa (psi)	138 (20)
System (intercooler) kPa (psi)	138 (20)
Cap (relief opening pressure) kPa (psi)	69 (10)

[a] Use the same type coolant that was drained from the cooling system. Do not mix coolant types.
[b] The addition of Motorcraft Cooling System Stop Leak Pellets, VC-6, darkens Motorcraft Premium Gold Engine Coolant from yellow to golden tan.

Torque Specifications

Description	Nm	lb-ft	lb-in
Water pump bolts	20	—	15
Dropping resistor screw	6	53	—
Degas bottle bolt	10	89	—
Intercooler radiator support bracket-to-bumper bolts	12	—	9
Intercooler radiator support bracket bolts	10	89	—

Supercharger Cooling

CAUTION: Some vehicle cooling systems are filled with Motorcraft Premium Engine Coolant VC-4-A (in Oregon VC-5, in Canada CXC-10) or equivalent meeting Ford specification ESE-M97B44-A (green color). Others are filled with Motorcraft Premium Gold Engine Coolant VC-7-A or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Always fill the cooling system with the same coolant that is present in the system. Do not mix coolant types.

NOTE: The addition of Motorcraft Cooling System Stop Leak Pellets, VC-6, darkens Motorcraft Premium Gold Engine Coolant from yellow to golden tan.

NOTE: The air that is produced from the supercharger is cooled by the intercooler.

Walter C. Avrea, the owner of patents 3,601,181 and RE 27,965, has granted Ford Motor Company rights with respect to cooling systems covered by these patents.

The cooling system components include the:

- intercooler
- intercooler radiator (8K226)
- pressure relief cap
- degas bottle
- electric water pump (8501)

The degas bottle:

- provides a location for system fill.
- contains coolant expansion and system pressurization.
- provides air separation during operation.
- replenishes the intercooler coolant to the system.

The intercooler coolant flows:

- from the intercooler to the degas bottle.
- from the degas bottle to the water pump.
- from the water pump to the intercooler radiator.
- from the intercooler radiator to the intercooler.

Engine coolant provides freeze protection, boil protection, cooling efficiency and corrosion protection to the engine and cooling components. In order to obtain these protections, the engine coolant must be maintained at the correct concentration and fluid level in the degas bottle.

When adding engine coolant, use a 50/50 mixture of engine coolant and clean, drinkable water.

To maintain the integrity of the coolant and the cooling system:

NOTE: The addition of Motorcraft Cooling System Stop Leak Pellets, VC-6, darkens Motorcraft Premium Gold Engine Coolant from yellow to golden tan.

- Add Motorcraft Premium Engine Coolant VC-4-A (in Oregon VC-5, in Canada CXC-10) or equivalent meeting Ford specification ESE-M97B44-A (green color), or Motorcraft Premium Gold Engine Coolant VC-7-A or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Use the same coolant that was drained from the cooling system. Do not mix coolant types.
- Do not add/mix orange-colored Motorcraft Speciality Orange Engine Coolant VC-2 or equivalent meeting Ford specification WSS-M97B44-D. Mixing coolants may degrade the coolant's corrosion protection.
- Do not add alcohol, methanol, brine, or any engine coolants mixed with alcohol or methanol antifreeze. These can cause engine damage from overheating or freezing.
- Do not mix with recycled coolant unless it meets the requirements of Ford specification ESE-M97B44-A or WSS-M97B51-A1. Not all coolant recycling processes meet these Ford specifications. Use of such coolants can harm the engine and cooling system components.

Supercharger Cooling

Special Tool(s)

ST1474-A	Pressure Test Kit 014-R1072 or equivalent
ST1720-A	Battery/Antifreeze Tester 014-R1060 or equivalent

Material

Item	Specification
Motorcraft Premium Engine Coolant VC-4-A (in Oregon VC-5, in Canada CXC-10)	ESE-M97B44-A
Motorcraft Premium Gold Engine Coolant VC-7-A	WSS-M97B51-A1
Motorcraft Cooling System Stop Leak Pellets VC-6 or equivalent	ESE-M99B37-5 except as noted in ES-F65E-19A511-AA

Inspection and Verification

WARNING: Never remove the pressure relief cap while the engine is operating or when the cooling system is hot. Failure to follow these instructions can result in damage to the cooling system or engine or personal injury. To avoid having scalding hot coolant or steam blow out of the degas bottle when removing the pressure relief cap, wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly. Step back while the pressure is released from the cooling system. When you are sure all the pressure has been released, (still with a cloth) turn and remove the pressure relief cap.

CAUTION: Check the coolant and engine oil levels. Top off the coolant level if needed. If there is engine coolant in the engine oil, the cause must be corrected and the oil changed or major component damage can occur.

CAUTION: Some vehicle cooling systems are filled with Motorcraft Premium Engine Coolant VC-4-A (in Oregon VC-5, in Canada CXC-10) or equivalent meeting Ford specification ESE-M97B44-A (green color). Others are filled with Motorcraft Premium Gold Engine Coolant VC-7-A or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Always fill the cooling system with the same coolant that is present in the system. Do not mix coolant types.

NOTE: The addition of Motorcraft Cooling System Stop Leak Pellets, VC-6, darkens Motorcraft Premium Gold Engine Coolant from yellow to golden tan.

1. Verify the customer's concern by operating the engine to duplicate the condition.

2. Inspect to determine if any of the following mechanical or electrical concerns apply.

Visual Inspection Chart

Mechanical	Electrical
● Radiator brackets ● Leaks ● Damaged hoses ● Hose clamps ● Water pump ● Radiator ● Degas bottle ● Water pump bracket	● Damaged water pump wiring

3. If the inspection reveals an obvious concern that can be readily identified, repair it as necessary.

4. Inspect the coolant condition.
    1. **WARNING: Never remove the pressure relief cap while the engine is operating or when the cooling system is hot. Failure to follow these instructions can result in damage to the cooling system or engine or personal injury. To avoid having scalding hot coolant or steam blow out of the degas bottle when removing the pressure relief cap, wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly. Step back while the pressure is released from the cooling system. When you are sure all the pressure has been released, (still with a cloth) turn and remove the pressure relief cap.**

       Allow the engine to cool. Once pressure is released, remove the pressure relief cap.
    2. **CAUTION: Check the coolant and engine oil level and top off the coolant if needed. If there is engine coolant in the engine oil the cause must be corrected and oil/fluid changed or major component damage can occur.**

       CAUTION: Some vehicle cooling systems are filled with Motorcraft Premium Engine Coolant VC-4-A (in Oregon VC-5, in Canada CXC-10) or equivalent meeting Ford specification ESE-M97B44-A (green color). Others are filled with Motorcraft Premium Gold Engine Coolant VC-7-A or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Always fill the cooling system with the same coolant that is present in the system. Do not mix coolant types.

       Inspect the coolant color:

       - If Motorcraft Premium Engine Coolant (green color) VC-4-A or equivalent meeting Ford specification ESE-M97B44-A has a clear, light green or blue color, this

indicates higher water content than required.

- **NOTE:** The addition of Motorcraft Cooling System Stop Leak Pellets, VC-6, darkens Motorcraft Premium Gold Engine Coolant from yellow to golden tan.

  If Motorcraft Premium Gold Engine Coolant (yellow color) VC-7-A or equivalent meeting Ford specification WSS-M97B51-A1 has a clear or pale yellow color, this indicates higher water content than required.
- Dark brown can indicate unauthorized stop leak may have been used. Use Motorcraft Cooling System Stop Leak Pellets VC-6 or equivalent meeting Ford specification ESE-M99B37-5 except as noted in ES-F65E-19A511-AA only.
- A light or reddish brown color indicates that rust may be present in the cooling system. Flush the system and refill with the correct mixture of water and engine coolant.
- An iridescent sheen on top of the coolant or a milky brown color can indicate a trace of oil is entering the system. For additional information on engine diagnosis, refer to Section 303-00 .

3. If the engine coolant appearance is acceptable, test the engine coolant freezing point range with the special tool. The freezing point should be in the range -50°F to -10°F. If the vehicle is driven in cold climates less than -34°F, it may be necessary to increase the coolant concentration to get adequate freeze protection.
   - Maximum coolant concentration is 60/40.
   - Minimum coolant concentration is 40/60.
4. Check the coolant system conditions:
   - If the intercooler fluid is low, add the specified coolant mixture only.
   - If the intercooler coolant fluid tests weak, add straight engine coolant until the readings are within acceptable levels.
   - If the engine coolant tests strong, remove some of the engine coolant and add water until readings are within acceptable levels.
5. If the concern remains after the inspection, determine the symptom(s). GO to Symptom Chart .
6. Verify the cooling system is correctly filled and bled. Refer to Supercharger Cooling System Draining, Filling and Bleeding in this section.

Symptom Chart

SYMPTOM CHART

Condition	Possible Sources	Action
• Loss of intercooler coolant	• Intercooler. • Intercooler radiator. • Water pump. • Coolant hoses. • Degas bottle.	• Go To Pinpoint Test A .

Pinpoint Tests

PINPOINT TEST A: LOSS OF COOLANT

Test Step	Result / Action to Take
A1 CHECK THE INTERCOOLER COOLANT LEVEL	**Yes** GO to A2 . **No** REFILL the coolant as necessary. GO to A2 .
WARNING: Never remove the pressure relief cap under any conditions while the engine is operating. Failure to follow these instructions could result in damage to the cooling system or engine and/or personal injury. To avoid having scalding hot coolant or steam blow out of the cooling system, use extreme care when removing the pressure relief cap from a hot degas bottle. Wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly one turn (counterclockwise). Step back while the pressure is released from the cooling system. When certain all the pressure has been released, remove the pressure relief cap (still with a cloth). NOTE: Allow the engine to cool before checking the engine coolant level. The engine must be off to check the coolant. ● Key in OFF position. ● Visually check the intercooler coolant level at the degas bottle. ● **Is the coolant level within specification?**	
A2 CHECK THE DEGAS BOTTLE PRESSURE RELIEF CAP	**Yes** GO to A3 . **No** CLEAN or INSTALL a new pressure relief cap. TEST the system for normal operation.
● **WARNING: Never remove the pressure relief cap under any conditions while the engine is operating. Failure to follow these instructions could result in damage to the cooling system or engine and/or personal injury. To avoid having scalding hot coolant or steam blow out of the cooling system, use extreme care when removing the pressure relief cap from a hot degas bottle. Wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly one turn (counterclockwise). Step back while the pressure is released from the cooling system. When certain all the pressure has been released, remove the pressure relief cap (still with a cloth).** ● Remove the pressure relief cap. ● Inspect the pressure relief cap for foreign material between the sealing gasket and the diaphragm. ● **Is the pressure relief cap OK?**	
A3 CHECK THE DEGAS BOTTLE	**Yes** INSTALL a new degas bottle. TEST the system for normal operation. **No** CARRY OUT the cooling system pressure test. REFER to the Component Tests in this section. REPAIR as necessary. TEST the system for normal operation.
● **WARNING: Never remove the pressure relief cap under any conditions while the engine is operating. Failure to follow these instructions could result in damage to the cooling system or engine and/or personal injury. To avoid having scalding hot coolant or steam blow out of the cooling system, use extreme care when removing the pressure relief cap from a hot degas bottle. Wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly one turn (counterclockwise). Step back while the pressure is released from the cooling system. When certain all the pressure has been released, remove the pressure relief cap (still with a cloth).** ● **NOTE:** The engine must be cool when coolant is added to the degas bottle. ● Add coolant to the degas bottle until fluid is between the coolant fill level marks. ● **Does the degas bottle leak?**	

Component Tests

Pressure Test

1. Turn the engine OFF.

2. **WARNING: Never remove the pressure relief cap under any conditions while the engine is operating. Failure to follow these instructions could result in damage to the cooling system or engine and/or personal injury. To avoid having scalding hot coolant or steam blow out of the cooling system, never remove the pressure relief cap from a hot degas bottle. Wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly one turn (counterclockwise). Step back while the pressure is released from the cooling system. When certain all the pressure has been released, remove the pressure relief cap (still with a cloth).**

   Check the intercooler coolant level. For additional information, refer to Supercharger Cooling System Draining, Filling and Bleeding in this section.

3. Connect the Radiator/Heater Core Pressure Tester to the degas bottle nipple. Install a pressure test pump to the quick-connect fitting of the test adapter.

4. **NOTE:** If the plunger of the pump is depressed too fast, an erroneous pressure reading will result.

   Slowly depress the plunger of the pressure test pump until the pressure gauge reading stops increasing and note the highest pressure reading obtained.

5. If the pressure relief cap does not hold pressure, remove and wash the pressure relief cap in clean water to dislodge all foreign particles from the gaskets. Check the sealing surface in the filler neck.

6. If 69 kPa (10 psi) cannot be reached, install a new pressure relief cap. If more than 12 kPa (18 psi) shows on the gauge, install a new pressure relief cap.

7. **CAUTION: If the pressure drops, check for leaks at the intercooler hoses or other system components and connections. Any leaks which are found must be corrected and the system rechecked.**

   NOTE: Intercooler system is not connected to the main engine cooling system.

   Pressurize the intercooler cooling system as described in Step 4 (using a pressure relief cap that operates within the specified upper and lower pressure limits). Observe the gauge reading for approximately two minutes; refer to General Specifications. Pressure should not drop during this time.

   - If the pressure drops and no external leak is found, the intercooler may be the cause. Remove and inspect the intercooler. Install a new intercooler if necessary.

8. Release the system pressure by loosening the pressure relief cap. Check the coolant level and replenish, if necessary, with the correct coolant mixture. For additional information, refer to Supercharger Cooling System Draining, Filling and Bleeding in this section.

Cap

WARNING: Never remove the pressure relief cap under any conditions while the engine is

operating. Failure to follow these instructions could result in damage to the cooling system or engine and/or personal injury. To avoid having scalding hot coolant or steam blow out of the cooling system, use extreme care when removing the pressure relief cap from a hot degas bottle. Wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly one turn (counterclockwise). Step back while the pressure is released from the cooling system. When certain all the pressure has been released, remove pressure relief cap (still with a cloth).

1. Immerse the pressure relief cap in water and install it on the shallow filler neck of Radiator/Heater Core Pressure Tester and Radiator Cap Adapter, part of Radiator/Heater Core Pressure Tester.

2. Immerse the filler neck seal in water and install it in the filler neck adapter.

3. Install the filler neck adapter with the filler neck seal to the Radiator Cap Adapter.

4. Connect the female quick-connect fitting of the pressure test pump to the male quick-connect fitting of the filler neck adapter.

5. **NOTE:** If the plunger of the pump is depressed too fast, an erroneous pressure reading will result.

   Slowly depress the plunger of the pressure test pump until the pressure gauge reading stops increasing and note the highest pressure reading obtained.

6. Release the pressure by turning the relief screw counterclockwise. Then tighten the pressure relief screw and repeat Step 6 (at least twice) to make sure the reading is repeatable within the specifications of the pressure relief cap.

7. If the pressure test gauge readings are not within specifications, install a new pressure relief cap. If the pressure test gauge readings are within specifications, carry out the cooling system pressure test.

Radiator Leak Test, Removed From the Vehicle

CAUTION: Never leak test an aluminum radiator or intercooler in the same water that copper/brass radiators are tested in. Flux and caustic cleaners may be present in the cleaning tank and they will damage aluminum radiators and intercoolers.

NOTE: Clean the radiator or intercooler before leak testing to avoid contamination of tank.

1. Leak test the radiator or intercooler in clean water with 138 kPa (20 psi) air pressure.

Supercharger Cooling System Draining, Filling and Bleeding

Draining

WARNING: Never remove the pressure relief cap while the engine is operating or when the cooling system is hot. Failure to follow these instructions can result in damage to the cooling system or engine or personal injury. To avoid having scalding hot coolant or steam blow out of the degas bottle when removing the pressure relief cap, wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly. Step back while the pressure is released from the cooling system. When certain all the pressure has been released, (still with a cloth) turn and remove the pressure relief cap.

CAUTION: The coolant must be recovered in a suitable, clean container for reuse. If the coolant is contaminated, it must be recycled or disposed of correctly and replaced.

CAUTION: Some vehicle cooling systems are filled with Motorcraft Premium Engine Coolant VC-4-A (in Oregon VC-5, in Canada CXC-10) or equivalent meeting Ford specification ESE-M97B44-A (green color). Others are filled with Motorcraft Premium Gold Engine Coolant VC-7-A or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Always fill the cooling system with the same coolant that is present in the system. Do not mix coolant types.

NOTE: The addition of Motorcraft Cooling System Stop Leak Pellets, VC-6, darkens Motorcraft Premium Gold Engine Coolant from yellow to golden tan.

NOTE: Less than 80% of coolant capacity can be recovered with the engine in the vehicle. Dirty, rusty or contaminated coolant requires replacement.

1. Raise and support the vehicle. For additional information, refer to Section 100-02 .
2. Remove the lower hose from the intercooler radiator and allow the coolant to drain.

Filling and Bleeding

CAUTION: Engine coolant provides freeze protection, boil protection, cooling efficiency and corrosion protection to the engine and cooling components. In order to obtain these protections, the engine coolant must be maintained at the correct concentration and fluid level in the degas bottle.

CAUTION: Some vehicle cooling systems are filled with Motorcraft Premium Engine Coolant VC-4-A (in Oregon VC-5, in Canada CXC-10) or equivalent meeting Ford specification ESE-M97B44-A (green color). Others are filled with Motorcraft Premium Gold Engine Coolant VC-7-A or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Always fill the cooling system with the same coolant that is present in the system. Do not mix coolant types.

NOTE: The addition of Motorcraft Cooling System Stop Leak Pellets, VC-6, darkens Motorcraft Premium Gold Engine Coolant from yellow to golden tan.

NOTE: When adding engine coolant, use a 50/50 mixture of engine coolant and clean, drinkable water.

1. To maintain the integrity of the coolant and the cooling system:
    1. Add Motorcraft Premium Engine Coolant VC-4-A (in Oregon VC-5, in Canada CXC-10) or equivalent meeting Ford specification ESE-M97B44-A (green color), or Motorcraft Premium Gold Engine Coolant VC-7-A or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Use the same coolant that was drained from the cooling system. Do not mix coolant types.
    2. Do not add/mix orange-colored Motorcraft Speciality Orange Engine Coolant VC-2 or equivalent meeting Ford specification WSS-M97B44-D. Mixing coolants may degrade the coolant's corrosion protection.
    3. Do not add alcohol, methanol, brine, or any engine coolants mixed with alcohol or methanol antifreeze. These can cause engine damage from overheating or freezing.
    4. Do not mix with recycled coolant unless it meets the requirements of Ford specification ESE-M97B44-A or WSS-M97B51-A1. Not all coolant recycling processes meet these Ford specifications. Use of such coolants can harm the engine and cooling system components.

2. Fill the degas bottle. Use Motorcraft Premium Engine Coolant VC-4-A (in Oregon VC-5, in Canada CXC-10) or equivalent meeting Ford specification ESE-M97B44-A (green color), or Motorcraft Premium Gold Engine Coolant VC-7-A or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Use the same coolant that was drained from the cooling system. Do not mix coolant types.

3. Start the engine and allow to run until coolant circulation is observed in the intercooler degas bottle. Absence of circulation indicates air is trapped in the system.
    - Turn the engine off.

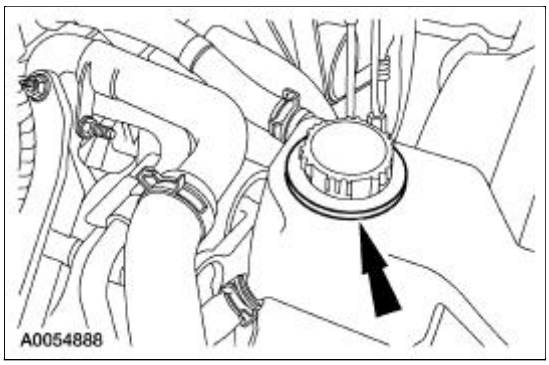
4. Add coolant as needed. Use Motorcraft Premium Engine Coolant VC-4-A (in Oregon VC-5, in Canada CXC-10) or equivalent meeting Ford specification ESE-M97B44-A (green color), or Motorcraft Premium Gold Engine Coolant VC-7-A or equivalent meeting Ford specification WSS-M97B51-A1 (yellow color). Use the same coolant that was drained from the cooling system. Do not mix coolant types.

5. Repeat the above procedure to make sure all entrapped air is released.

Supercharger Cooling System Flushing

1. **WARNING: Never remove the pressure relief cap while the engine is operating or when the cooling system is hot. Failure to follow these instructions can result in damage to the cooling system or engine or personal injury. To avoid having scalding hot coolant or steam blow out of the degas bottle when removing the pressure relief cap, wait until the engine has cooled, then wrap a thick cloth around the pressure relief cap and turn it slowly. Step back while the pressure is released from the cooling system. when you are sure all the pressure has been released, (still with a cloth) turn and remove the pressure relief cap.**

   Once pressure is released, remove the pressure relief cap.



2. Drain the cooling system. For additional information, refer to Supercharger Cooling System Draining, Filling and Bleeding in this section.

3. **NOTE:** Refer to the cooling system flusher manufacturer's operating instructions for specific vehicle hook-up.

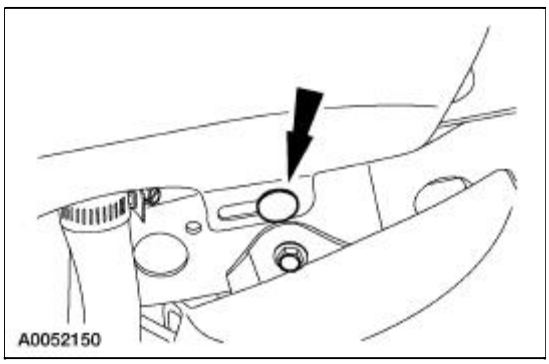
   Using an appropriate cooling system flusher, flush the intercooler cooling system.
   Use Premium Cooling System Flush VC-1 meeting Ford specification ESR-M14P7-A.

4. Fill the cooling system. For additional information, refer to Supercharger Cooling System Draining, Filling and Bleeding in this section.

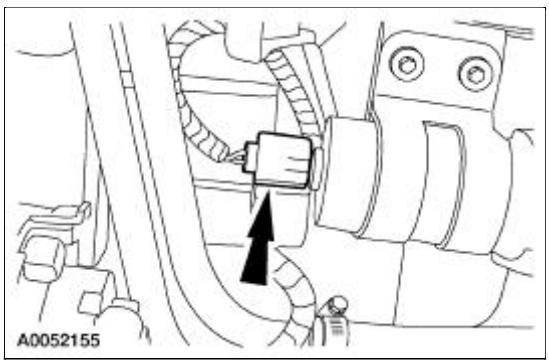
Water Pump

Removal and Installation

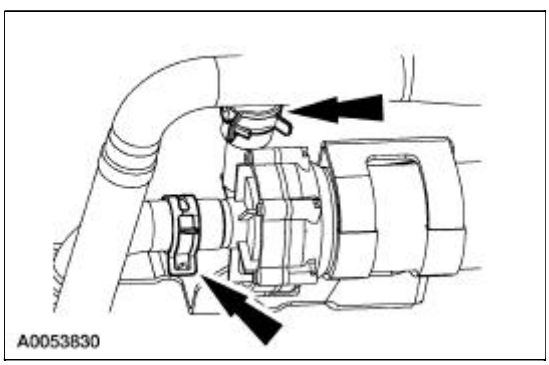
1. Disconnect the battery ground cable.
2. Drain the coolant. For additional information, refer to Supercharger Cooling System Draining, Filling and Bleeding in this section.
3. Remove the retainer and position the inner fender well aside.



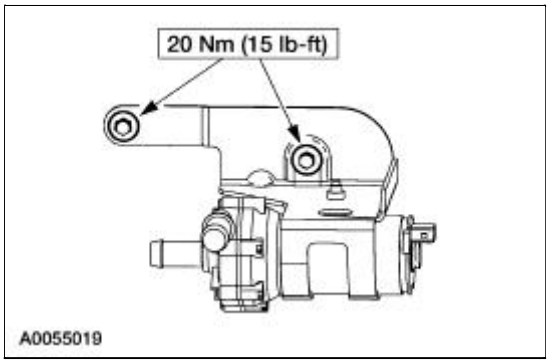
4. Disconnect the water pump electrical connector.



5. Disconnect the coolant hoses.



6. Remove the bolts and the water pump.



7. To install, reverse the removal procedure.

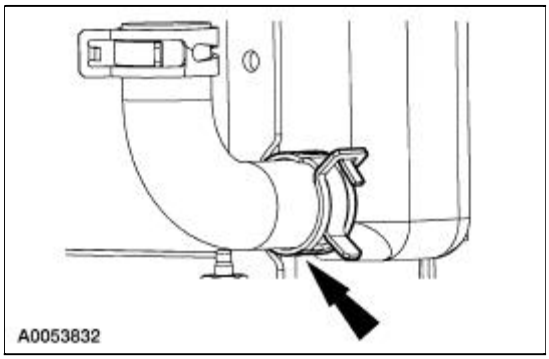
Radiator

Removal and Installation

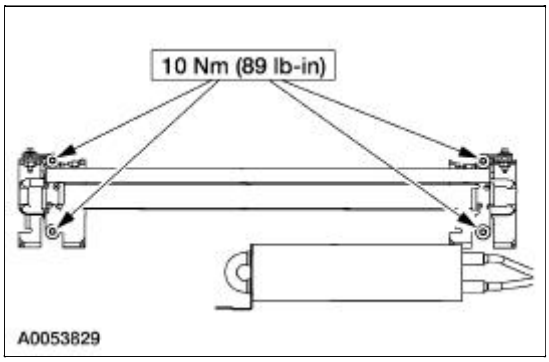
1. Drain the coolant. For additional information, refer to Supercharger Cooling System Draining, Filling and Bleeding in this section.

2. **NOTE:** RH is shown LH is similar.

   Disconnect the two coolant hoses.



3. Remove the bolts and the radiator.



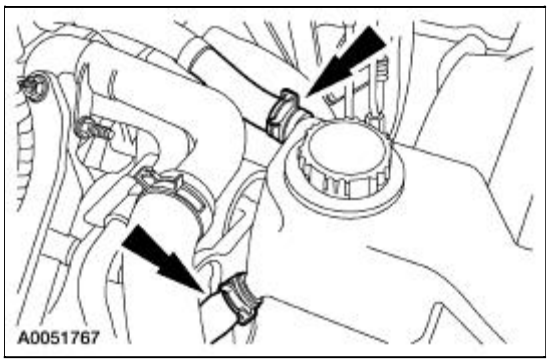
4. To install, reverse the removal procedure.

Degas Bottle

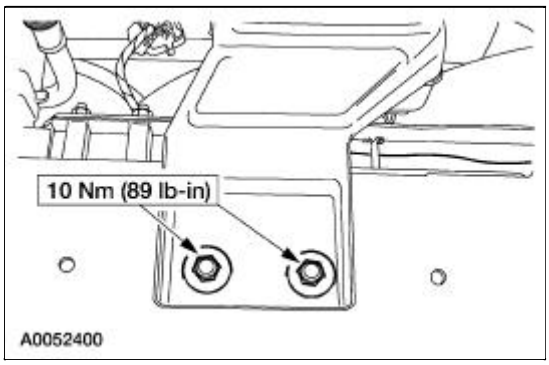
Removal and Installation

1. Drain the coolant. For additional information, refer to Supercharger Cooling System Draining, Filling and Bleeding in this section.

2. Disconnect the coolant hoses.



3. Remove the bolts and the degas bottle.



4. To install, reverse the removal procedure.